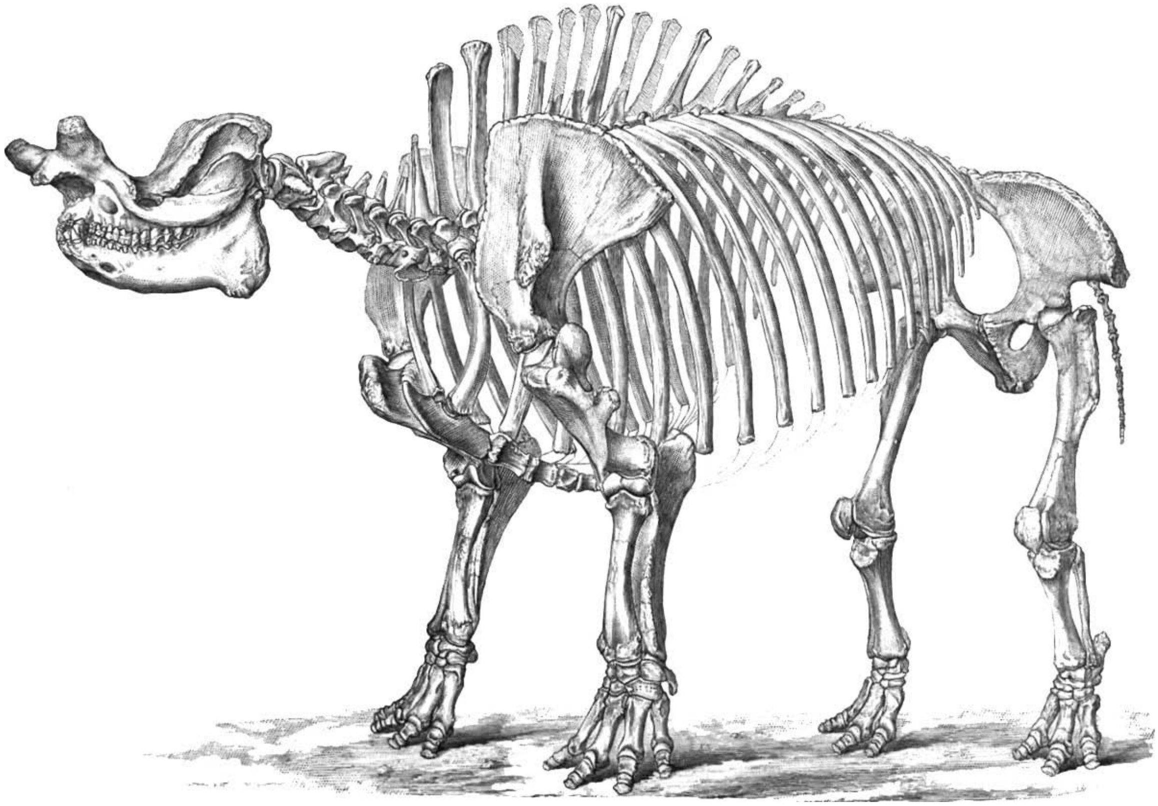
Rhinoceroses as of not more than specific importance, this species should be included in the type genus.

These Titanotherioids appear to have been most nearly allied to the Rhinoceroses among existing forms, as is at once apparent from the contour of the skull. According to Prof. Marsh they were larger than the Dinocerata of the Eocene, and nearly equalled in size the existing elephants. The skull differs from those of the rhinoceroses, however, in that instead of having one or two horns placed in the middle line of the nasal region and having no sort of bony connection with the skull itself, it has two large processes of solid bone in a transverse line immediately over the nose, which were probably invested with a horny sheath.

The molar teeth are, moreover, unlike those of the rhinoceroses, having excessively low crowns, and an arrangement of the tubercles and ridges very similar to that obtaining in the Tertiary genera *Limnohyus* and *Chalicotherium*; the first of which is certainly, and the latter probably, a Perissodactyle, although the recent discovery that the peculiar claws upon the evidence of which the supposed Edentate genus *Macrotherium* was founded are referable to it, render it a most aberrant type.



Restoration of the skeleton of *Titanotherium robustum* ($\frac{1}{24}$ nat. size). After Marsh.

The skeleton to which the original of the cast presented to the Museum pertains was found in 1874 by the donor in those beds of the Dakota Miocene known as the Brontotherium beds, and it appears to be the best preserved example yet known. A restoration is given in the accompanying woodcut. According to Prof. Marsh these deposits are several hundred feet in thickness, and may be separated into horizons, characterized by peculiar species of *Titanotheriidæ*. The remains of several hundred individuals of this exclusively American group have already been secured by the palæontologists of New Haven, and their English *confrères* look forward to the publication of the sumptuous monograph in which Prof. Marsh promises to illustrate these specimens with much interest.

NOTES.

THERE is some talk of a Committee of the Royal Society being appointed to investigate the subject of colour-blindness, and the proper methods of testing the colour-vision of *employés* on railways.

WE may remind our readers that all applications for assignments from the Government Grant must be sent to the Assistant Secretary of the Royal Society on or before the last day of February. Applications received after that date will not be considered by the Committee of this year.

AN influential Committee has been formed for the purpose of securing that the scientific and other friends of the late Dr. McNab, Professor of Botany in the Royal College of Science, Dublin, shall have an opportunity of expressing their appreciation of his work and their respect for his memory. Through no fault of his own, Prof. McNab was unable to make adequate provision for his wife and five children; and it is proposed that the memorial shall consist of a fund, sufficiently large to be of real service to his family. A good many subscriptions have already been received or promised, and we hope that many more may be forthcoming. Mr. Greenwood Pim, Easton Lodge, Monkstown, Co. Dublin, acts as hon. secretary; Prof. W. N. Hartley, F.R.S., Royal College of Science, Dublin, as hon. treasurer. As Prof. Hartley has been obliged to leave Dublin for some time, all communications should be addressed, and cheques made payable, to the hon. secretary.

WE have already (p. 207) called attention to the fact that a committee has been formed in Paris for the purpose of making arrangements for the erection of a statue of the late M. Boussingault. His work marked an era in the history of the agricultural sciences, and we have no doubt there will be a prompt and liberal response to the committee's appeal for subscriptions. M. Pasteur is the honorary president of the committee. The acting president is M. Schlœsing, and the following are the vice-presidents: MM. Berthelot, Duchartre, Laussedat, Peligot, Risler, and Tisserand. MM. Müntz and Sagnier are the secretaries, and M. Liébaut is treasurer.

THE death of M. Sébastien Vidal, Director of the Botanic Garden at Manilla, is announced. He was well known for his researches on the flora of the Philippine Islands.

THE scheme of the Senate of the University of London, drawn up in accordance with the recommendations of the recent Royal Commission, does not at all commend itself to the authorities of the provincial Colleges. They are convinced that it would be most injurious to the interests of places of education outside the capital. This view was strongly expressed last autumn at a meeting of representatives of the provincial Colleges at Birmingham, and yesterday (Wednesday) it was pressed upon the attention of Lord Cranbrook by a deputation which waited upon him at the Privy Council Office.

TO-MORROW afternoon (Friday), at the Royal United Service Institution, Mr. H. Dent Gardner will read a paper on "The Ship's Chronometer—its History and Development." The paper will be divided into four parts: (1) historical, (2) historical-descriptive (the building up of the chronometer), (3) the chronometer of to-day, and (4) methods of testing and rating chronometers.

THE Ben Nevis Observatory Monthly Report for January is of more than usual interest. The rainfall during the month amounted to 29·42 inches, being 15·10 inches above the mean of the month since the Observatory was opened in 1883. A measurable quantity fell every day, and on 11 days over an inch was recorded each day, while on the 14th, 3·88 inches fell. The total bright sunshine amounted to only 4 hours, being the smallest number hitherto recorded. Lightning occurred on 5 days. The storm of the 5th was peculiarly severe, on which occasion the telegraph cable was damaged and communication stopped. St. Elmo's Fire was seen on the 21st and 25th, under the same relations to the cyclones then passing over North-Western Europe as described recently in NATURE.

WE have received from Mr. C. L. Wragge, Government Meteorologist of Queensland, his first Annual Report of the Meteorological Branch of the Post and Telegraph Department for the year 1887. It is divided into three sections. Section 1 gives an account of the organization, inspections, &c., containing a list of the recommendations originally made by Mr. Wragge, and a general statement as to how far each of them has been carried out. This synopsis shows that, while he has accomplished much during the year 1887, more still remains to be done. Section 2 contains abstracts of reports for each month from the rainfall stations, with climatological and other tables from the stations which are supplied with instruments. These abstracts contain very interesting data upon the state of the country, and will become more valuable in proportion as the number of verified instruments to be supplied year by year increases. As Mr. Wragge himself points out, any conclusions from so short a series of observations would be premature. Section 3 contains a graphic record of the chief meteorological elements for Brisbane, with seasonal wind charts and cloud charts for Queensland, and specimen wind charts for Australasia. These form the most interesting portion of the Report, and give promise of valuable materials for scientific study. In Western Australia, however, the weather charts show that there are vast tracts of country with apparently no meteorological stations.

THE last issue of the *Memoirs* of the Tashkent Observatory (Part 3) contains a most valuable magnetical map of part of Central Asia, based on the recent measurements of MM. Sharnhorst and Schwarz.

WE have already mentioned some of the conclusions as to the secular upheaval of the coasts of Finland which may be drawn from the accurate measurements made since 1858 under the direction of the Finska Vetenskaps-Societeten. We have now an elaborate paper on this subject, contributed by A. R. Bonsdorf to the *Izvestia* of the Russian Geographical Society (vol. xxv. 5). It appears from the mathematical analysis to which the measurements have been submitted that the average upheaval of the coasts of South-West Finland is 55 centimetres per century; and that the rate of upheaval increases from Ut-ö (in the Åland Islands) towards the north, and towards the east as far as Porkala (not far from Helsingfors), whence it decreases again towards the east. The interpolation formulæ better correspond to actual measurements if the changes of the level of the Baltic Sea resulting from the changes of atmospheric pressure are taken into account.

Globus reports that the Russian Geographical Society has presented a memorial to the Minister of Marine urging that scientific investigations of various kinds should be undertaken in connection with the Black Sea. Amongst other things, the Society points out that more exact soundings are needed in several parts of that sea, and that it is especially desirable they should be taken in the western part between Odessa and Constantinople.

ONE of the problems presented by the frightful eruption of Mount Bandai in Japan, two years ago, was the manner in which a large number of holes in the earth in the neighbourhood of the mountain were formed. It was suggested that they owed their existence to the falling of rocks and stones cast up the eruption, while another theory was that they were formed by forces beneath the surface. At the last meeting of the Seismological Society of Japan, Dr. Knott read a paper on the first theory, in which he demonstrated that it was quite insufficient to account for the phenomena. Prof. Milne, it may be added, has expressed the same view from the beginning.

LAST Friday a valuable paper on "The Utility of Forests and the Study of Forestry" was read before the Indian Section of the Society of Arts by Dr. W. Schlich, Professor of Forestry at the Royal College of Engineering, Cooper's Hill. In the course of his remarks Dr. Schlich gave an account of the instruction in forestry at Cooper's Hill, and mentioned that the authorities were thinking of appointing a second professor of the subject, and thus doubling the amount of instruction now given. After the reading of the paper Major-General Michael, C.S.I., who presided, made some interesting observations. No one, he said, who had visited the great forest regions of Germany, Austria, and France could fail to be impressed with the visible effects of good management, and to wish they were more generally apparent in England and Scotland. There were signs that the education and practical training of foresters were being more thought of at the present time in England, and he ventured to predict that Dr. Schlich would shortly have a good many students under him who were destined for home employment and not for India only. Personally he knew more about the value of forestry and the life of a forester in India, having spent seven or eight of the happiest and perhaps the most useful years of his youth as a forest officer. That was more than 40 years ago, before the time arrived for experts like Dr. Schlich and his distinguished predecessor Sir Dietrich Brandis to come to the country. He could therefore tell any of Dr. Schlich's students who might be present that the life of a forester in India was not only a career of importance, but that it was one full of interest and of real enjoyment. The formation of the department in which they would serve had justly been characterized by Sir Richard Temple as one of the greatest achievements effected in India during the Queen's reign.

THE Royal Society of New South Wales offers its medal and a prize of £25 for the best commnication (provided it be of sufficient merit) containing the results of original research or observation upon each of the following subjects :—(To be sent in not later than May 1, 1890)—The influence of the Australian climate (general and local) in the development and modification of disease ; on the silver ore deposits of New South Wales ; on the occurrence of precious stones in New South Wales, with a description of the deposits in which they are found. (To be sent in not later than May 1, 1891)—The meteorology of Australia, New Zealand, and Tasmania ; anatomy and life history of the Echidna and Platypus ; the microscopic structure of Australian rocks. (To be sent in not later than May 1, 1892)—On the iron ore deposits of South Wales ; on the effect which settlement in Australia has produced upon indigenous vegetation, especially the depasturing of sheep and cattle ; on the coals and coal measures of Australasia. The competition is not confined to members of the Society, nor to residents in Australia.

M. LIGNIER has been appointed Professor of Botany to the Faculty of Sciences at Caen ; and Mr. G. C. Druce, author of the "Flora of Oxfordshire," succeeds Dr. Schönland as Curator of the Fielding Herbarium at Oxford.

HERR JADIN, of Montpellier, has undertaken a voyage for the investigation of the algal flora of the islands Mauritius and Réunion ; and Prof. P. L. Menyhardt, who has been appointed to a mission on the Zambesi, is intending to make a collection of plants in the region between the Zambesi and the sources of the Congo.

FOR the purpose of growing plants under more natural conditions than those usually afforded by the soil and surroundings of ordinary botanic gardens, M. G. Bonnier, the Director of the Botanic Garden in Paris, has obtained from the Director for Higher Education in Paris the grant of a piece of land in the Forest of Fontainebleau, as an annexe for experimental culture. It has been placed under the special charge of M. Cl. Duval.

AT the meeting of the Royal Botanic Society on Saturday a sweet-scented fern, from the Society's garden, was exhibited. The perfume, which closely resembles that of fresh hay, is retained after the frond is dry, and lasts for many months, if not years, imparting its fragrance to anything in contact with it. The secretary thought it might be grown as a source of perfume by amateurs, if not commercially. As yet it appeared to be little known in collections of exotic ferns. Some fine blooms of scarlet anemone, gathered from plants growing in the open air in Rutland, were shown by Mr. T. H. Burroughes.

IT is a good sign that the present building of the Bethnal Green Free Library has become quite inadequate for the needs of the institution, and that much larger premises are, if possible, to be erected. The sum of £20,000 is required, and many donations have already been received or promised. We may note that a largely attended meeting at the Bethnal Green Free Library lately started as tudents' union, for the study of various branches of science and art, in connection with the evening classes.

IN his "History of Barbados," published in 1848, Sir Richard Schomburgk says of the Barbados monkey that it was found in large numbers by the first settlers. From the appearance of a living specimen he considered it "to be *Cebus capucinus*, Geoff., the Sai or Weeper, or a very closely allied species." In the current number of the *Zoologist* Col. H. W. Feilden presents a wholly different view. He asserts that the Barbados monkey is an Old World form, the Green Monkey, *Cercopithecus callitrichus*, Is. Geoffr., and that its original habitat is West Africa. "This," he says, "undoubtedly proves its introduction to Barbados by the Guinea trading-ships." Col. Feilden cannot discover any warrant for Schomburgk's statement that this animal was found in large numbers by the first settlers on their arrival. The subject is interesting because of its bearing on the general view set forth by Col. Feilden, that Barbados has had no continental connection since the introduction of its present flora and fauna, but has received its terrestrial animals and plants from the effects of ocean currents, winds, accidental occurrences, or by the agency of man.

THE Council of the Ceylon Asiatic Society, in its last Report, urges on the Government the importance of systematically collecting, transcribing, and publishing the manuscripts of the ancient literature of the island which are scattered about in the libraries of temples, as well as in private houses. The researches which have already been made by individuals, or on behalf of the Government, show that manuscripts of great value may be found. During the last three years, private exertions have secured 69 of these ; but what is needed is that the work should be undertaken as carefully and systematically as in India, where the duty of preserving the ancient literature of the country has been recognized by the Government, and where the collection of ancient manuscripts has for years past been conducted by a large staff of officers.

SUGAR seems to be losing its attractions for Lepidoptera. Mr. Joseph Anderson writes to the *Entomologist* from Chichester that his experience agrees with all that has been written on this subject lately. In the trees surrounding his house, and in those of his neighbour's garden, he has good sugaring grounds, and in former years they brought him a satisfactory return for the trouble expended on them, his captures numbering about fifty different species. "Now," he says, "for three or four years past, night after night, sugaring has been almost of no avail. Can it be a case of inherited instinct? And are the rising generation of moths getting too wise to be trapped by the sugaring baits?"

WITH the aid of an apparatus called a *periscope*, the submarine boat *Gymnote* was lately, it will be remembered, piloted safely in Toulon harbour. This enables the officer directing the movements to have a wide view around ; and it consists of a vertical telescopic arrangement, with a lenticular total reflection prism at the top held between the tube and a cover above. After reflection in the prism, the rays converge at a certain point, and are received by a lens, the principal focus of which coincides with this point ; thus a vertical cylindrical beam is formed, which meeting a mirror below, inclined at 45°, is directed horizontally to the eye-piece. A diaphragm, having a small radiating tongue, and moved by a tangent screw, enables one to intercept the view of the vertical plane in which the sun is, the tongue being brought to coincide with the plane. The system is said to work admirably.

EXPERIMENTING lately on the sense of smell, Dr. Zwardemaaker, of Utrecht, devised an olfactometer, which consists simply of a glass tube with upward curving part to be inserted in the nostril. A short movable cylinder made of some odoriferous substance fits over the outer straight end of the tube.

On inhaling, one perceives no odour so long as this cylinder does not project beyond the inner tube; but the further it is pushed out, the larger is the scented surface presented to the entering air, and the stronger the odour perceived. The author studies mixture of odours by applying a cylinder saturated with a scented body to the end of the olfactometer, and varying the length of the two odoriferous substances. But he considers a double olfactometer better (one tube for each nostril). With this, one may easily experience how one odour will overwhelm another; rubber, *e.g.*, causing the smells of paraffin, wax, and tolu to disappear. Even with very strong excitants, there is never a mingling of sensations. Either the one or the other odour is perceived, till by careful equilibration of the two, no sensory effect at all is perceived. Sensibility is quite eliminated.

THE Verein für Erdkunde, of Halle, is arranging for a hydrographical and zoological investigation of the Lake of Ploen, in Holstein.

VIENNA and Berlin will shortly be connected by telephone.

A PRETTY and convenient celluloid paper knife is being sent by Messrs. Woodhouse and Rawson United, Limited, to their clients. No one who uses it can doubt that celluloid may for some purposes be a very good substitute for ivory.

MESSRS. WILLIAM WESLEY AND SON have issued No. 99 of their "Natural History and Scientific Book Circular." It consists of a list of works in astronomy, mathematics, and physics.

A PAPER upon phosphorus trifluoride is contributed by M. Moissan to the February number of the *Annales de Chimie et de Physique*. In a previous communication it was shown that this interesting gas could be obtained either by heating a mixture of lead fluoride and copper phosphide, or by the action of arsenic trifluoride upon phosphorus trichloride. Since that time it has been found that a regular and more rapid evolution of phosphorus trifluoride occurs when a mixture of zinc fluoride and phosphorus tribromide is gently warmed, and this appears to be by far the most convenient way of obtaining the gas in quantity. Zinc fluoride reacts much more rapidly than lead fluoride, and is best prepared by the action of pure hydrofluoric acid upon zinc carbonate. The insoluble fluoride thus obtained is washed with distilled water and dried at 200° C. It is important not to raise the temperature beyond this point, as further heating renders it much less easily attacked by phosphorus tribromide. The dry zinc fluoride is then placed in a brass tube closed at one end and fitted at the other with a double bored ordinary cork, well paraffined, and through which pass two tubes, one a delivery tube of lead, and the other a kind of dropping funnel, from which the tribromide of phosphorus is allowed to slowly fall upon the gently warmed fluoride of zinc. As soon as the temperature of the latter has begun to rise, the action becomes very energetic, and in a few moments several litres of the gas may be collected. In order to free the phosphorus trifluoride from admixed vapour of phosphorus tribromide, it is quite sufficient to allow it to bubble through a little water contained in a small wash bottle, after which it may be dried by passing through tubes containing pumice, which has been boiled in strong oil of vitriol, and heated until only the minimum quantity of sulphuric acid remains adhering to it, inasmuch as the strong acid absorbs a notable quantity of phosphorus trifluoride. The gas is finally collected over mercury. The reaction occurring during the preparation is stated to be as follows:—

$$3ZnF_2 + 2PBr_3 = 2PF_3 + 3ZnBr_2.$$

Gaseous trifluoride of phosphorus as thus prepared possesses a very sharp odour, but does not fume in the air. It is very slowly absorbed by water, but is decomposed immediately by solutions of chromic acid or potassium permanganate. As the above reaction appears to yield the gas in a very pure state, M. Moissan has made determinations of its density, and finds it to be 3·03. The calculated density of PF_3 is 3·08. When a measured quantity of the gas is heated over mercury in a closed glass vessel, it is totally decomposed by the silica of the glass, and the volume diminishes by one-fourth, four molecules of PF_3 becoming converted into three molecules of gaseous silicon tetrafluoride, SiF_4.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*) from Madagascar, presented by the executors of Dr. Allen; a Vulpine Phalanger (*Phalangista vulpina* ♀) from Australia, presented by Mr. W. H. Seward; a Hamster (*Cricetus frumentarius*) from Russia, presented by Mr. Harold Hanauer, F.Z.S.; an Alligator (*Alligator mississippiensis*) from Florida, presented by Mr. A. B. Archer; a Hoffmann's Sloth (*Cholopus hoffmanni*) from Panama, deposited.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on February 3 = 7h. 35m. 32s.

Name.	Mag.	Colour.	R A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 1546	—	—	7 29 42	+35 28
(2) DM. + 14° 1729...	6	Yellowish-red.	7 35 51	+14 28
(3) β Geminorum ...	2	Yellowish-white.	7 38 36	+28 18
(4) α Canis Minoris ...	1	Bluish-white.	7 33 30	+ 5 31
(5) 89 Schj.	7	Yellowish-red.	7 2 55	- 11 47
(6) S Hydræ	Var.	Reddish-yellow.	8 47 50	+ 3 29

Remarks.

(1) The General Catalogue description of this nebula is as follows:—"Pretty bright; considerably small; round; very gradually a very little brighter in the middle; mottled as if with stars; almost planetary." The spectrum of the nebula has not yet been recorded.

(2) Dunér describes the spectrum of this star as a very fine example of the Group II. type. He states that all the bands 2–8 are wide and dark, especially 2 and 3, and that the whole spectrum is well developed. No mention is made of the presence or absence of absorption lines, but there is little doubt that some will be found if looked for, the predominance of the bands 2 and 3 probably indicating that the star belongs to a later species, and is therefore approaching Group III., in which line absorption is predominant. Observations of the green and blue carbon flutings are also suggested (see p. 305).

(3) This star has hitherto been described as having a spectrum of the solar type. The usual observations, as to whether the temperature of the star is increasing (Group III.) or decreasing (Group VI.) are required.

(4) Gothard classes Procyon with stars of Group IV., but the Henry Draper Memorial photograph of the spectrum seems to indicate that it would be more properly described as an early stage of Group V., differing from the solar spectrum in having the hydrogen lines more developed and the metallic lines slightly thinner. Further observations of the visible spectrum are suggested.

(5) According to Dunér the spectrum of this star belongs to Group VI., and shows the usual three absorption bands of carbon. Band 6, which appears to be the most variable, is stated in this case to be very dark, and the question is, Are there any other variations in the spectrum accompanying the condition in which band 6 is dark? It seems probable that the number and intensities of the secondary bands will be found to vary with band 6, and these should, therefore, receive special attention.

(6) This variable has a spectrum of the Group II. type, but Dunér does not give a complete description, as he probably did